REMARKS

I. INTRODUCTION

Applicants hereby respectfully request further reconsideration of the Application in light of the arguments to appear hereinafter. A clean set of claims is submitted herewith as Exhibit A, as permitted by new rule 37 CFR § 1.121. None of the claims have been amended since Applicants' last amendment.

II. DRAWINGS

Applicant has amended Figures 1, 2, and 4-7 to include particular legends. Applicants believe that these amendments satisfy the requirement for a legend as set forth in the Office Action, and for a complete response per 37 C.F.R. § 1.85. Approval of the proposed amendments, as shown in red-ink markings submitted herewith under separate cover entitled *Submission of Proposed Drawing Amendment for Approval by Examiner* is respectfully requested. Applicant will submit finalized, formal drawings to the PTO draftsman for approval as to form when the application is allowed.

III. WITHDRAWAL OF "FINAL" STATUS

Applicants respectfully note that pursuant to Office policy, MPEP § 706.02, "prior art rejections should ordinarily be confined strictly to the best available art . . . Merely cumulative rejections . . . should be avoided." (emphasis added).

The present Office Action presents no less than six grounds of rejection for the same claims. Moreover, the particular bases for rejection (*e.g.*, § 102 or § 103), in view of the references used by the Office, make it difficult if not impossible to ascertain the legal position of the Office, thereby denying Applicants a full and fair opportunity to respond in accordance with principles of due process. For example, all pending claims stand rejected under 35 U.S.C. § 102 over Elton et al. alone. However, the Office Action also presents another rejection of the very same claims under 35 U.S.C. § 103 based on Elton et al. and other

secondary references. Likewise, all claims are rejected under § 102 over Jeanneret alone, yet other grounds of rejection (§ 103) relies on Jeanneret as a secondary reference. In all, if it is the Office's position, for example, that Elton et al. disclose all the limitations of all of the claims, then this should be the basis for the rejection. Rejecting the claims under § 103 where Elton et al. is the primary reference, presents the contrary position that Elton et al. does not meet all the claim limitations, contrary to the § 102 rejection. In all, four different "primary" references are employed in making the six § 102 or § 103 rejections.

Moreover, as to the plural § 103 rejections (which assume a difference between the claimed invention and the "prior art"), the particular limitation that is not met is not identified. For example, as to the first ground of rejection, the Office Action states that "Figures 1 and 2 disclose the claimed invention except for teaching of having the electrical cable comprised of a plurality of uninsulated stranded conductors and an insulated stranded conductor." This is the only difference stated in that ground of rejection, however, the recited difference is not even called out in claim 1. The law requires, and Applicants are entitled to, a clear articulation of the grounds of the § 103 rejection.

It does not appear that any of the reasons to justify an exception from the "best available art" rule set forth in MPEP § 706.03 exist, at least none that the Office has specified. Accordingly, Applicants respectfully request that a new, non-final Office Action be issued in accordance with the Office policy set forth in MPEP § 706.02.

IV. REJECTION OF CLAIMS 1-9, 12-29, 31-52, AND 54-55 UNDER 35 U.S.C. § 103(a)

Claims 1-9, 12-29, 31-52, and 54-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicant Disclosed Prior Art Figures 1 and 2 in view of Takaoka et al. (U.S. Patent No. 5,094,703) and further in view of Jeanneret (U.S. Patent No. 5,408,169) and in light of Shildneck (U.S. Patent 3,014,139) or Breitenbach et al. (U.S. Patent No. 4,785,138). Applicants respectfully traverse this rejection for at least the following reasons.

The Office asserts that Figures 1 and 2 disclose the claimed invention except for a teaching of having the electrical cable comprised of a plurality of uninsulated stranded

conductors and an insulated stranded conductor. Applicants disagree about what Figs. 1 and 2 show. Figs. 1 and 2, and the text associated therewith (see instant specification pages 1-2), disclose no more than an induction type frequency converter, consisting of two mechanically and electrically coupled wound rotor induction machines A and B, the stator windings of A connected to a 3-phase supply line at line frequency (V_i, F_i), stator windings of B representing the variable frequency output V_o, F_o. The rotor windings of A and B are connected together with a special arrangement. Based on the foregoing, in addition to what the Office has conceded, Figs. 1 and 2 further do not disclose substantially all of claim 1, particularly any of what is quoted below:

> wherein the converter comprises a rotor which rotates in dependence of the first and second frequencies f_1, f_2, and wherein at least one of said stators includes at least one winding forming at least one uninterrupted turn, said winding including a current-carrying conductor and a magnetically permeable, electric field confining insulating covering surrounding the conductor, including an inner layer having semiconducting properties being in electrical contact with the conductor, an insulating layer surrounding the inner layer being in intimate contact therewith and an outer layer having semiconducting properties surrounding the insulating layer and being in intimate contact therewith, wherein each layer forms substantially equipotential surface.

Applicants do not see, nor has the Office shown, how Figs. 1 and 2 meet the above recitations, as contended.

THE JEANNERET REFERENCE

The Office also asserts that Jeanneret shows a high voltage electric machine that comprises a stator, a rotor and a winding. The Office further alleges that the above reference shows, via its figures and corresponding disclosure, that at least one of said windings comprises (1) a cable with at least one current carrying conductor, (2) a magnetically permeable, electric field confining cover surrounding the conductor, and (3) one uninterrupted turn in the corresponding winding of said machine. Applicants disagree.

After a careful and thorough examination of the reference, Applicants do not see where such disclosure resides. In reviewing the reference, Applicants have found four

instances where a winding is discussed. Applicants respectfully direct the Office's attention first to column 1, lines 11-15, of the reference where Jeanneret states:

> A type of asynchronous motor known to the person skilled in the art comprises a stator having a first winding and a rotor having a second electrically-self-contained winding.

Applicants respectfully further direct the Office's attention to column 2, lines 43-46:

> a stator winding arranged to produce a turning magnetic field at a stator frequency in response to an AC supply voltage applied to said stator winding and producing a supply current...

The Office's attention is next directed to column 4, lines 17-19:

> In Fig. 1, asynchronous motor 2 comprises a stator 4 and rotor 6, the stator 4 comprising a winding 8 connected to electrical supply means 10.

Lastly, the Office's attention is directed to column 4, lines 37-39:

> The stator winding 8 is arranged in such a manner that said AC supply current flowing therein generates a turning magnetic field at a stator frequency....

Nowhere does Jeanneret disclose any particular type of conductor for the winding, let alone that it is specifically a cable with an electric field confining cover, situated in one uninterrupted turn. The only disclosure pertinent to the instant invention is that of the generic disclosure of the components of electric machines, those being a stator, rotor and associated windings.

It is the burden of the Patent and Trademark Office to prove a *prima facie* case of obviousness in order to deny the issuance of a patent. Applicants assert that the Office has not established a *prima facie* case of obviousness, and therefore, respectfully request that this rejection be reconsidered and withdrawn.

NO MOTIVATION TO COMBINE

The Office submits that it would have been obvious to provide the circuitry of Jeanneret and the windings of Applicant Disclosed Prior Art Figures 1 & 2, comprising insulated and uninsulated electrical conductor strands using round conductors in high voltage

applications as shown in Shildneck or Breitenbach since such a modification, according to Takaoka, would reduce the amount of insulation needed and the number of electric connections required in the end windings. Applicants submit that this is an improper combination as there is no incentive or motivation in any of the references that supports the combination.

Applicants do not believe there is a proper incentive or motivation to combine Takaoka et al. with Figs. 1 and 2. The Office states that Takaoka et al. teach having a stranded conductor for an electrical cable comprising a combination of uninsulated stranded conductor and an insulated stranded conductor. The Office also cites that this alleged modification would reduce the amount of insulation needed, as well as the number of conductors. Applicants respectfully assert that Takaoka et al. is simply a conventional device, which does not employ a high voltage cable as a winding. Takaoka et al. may disclose a conductor having insulated and uninsulated strands. However, the purpose of this feature in Takaoka et al. is to reduce the "skin effect" associated with self induced currents in a transmission and distribution cable. It has nothing to do with a cable winding, much less reducing eddy currents when the cable is used as a winding of an electromagnetic device.

In the instant invention, the insulated strands reduce eddy current losses by restricting the paths for such currents between the conductive strands. Eddy currents are induced in the winding as a result of the exposure of the winding to high magnetic fields in the rotating electric machine. These currents are problematic in these applications because they create electrical losses which are manifested as thermal energy (heat), which in turn causes a number of reliability problems in rotating machines. The invention from the reference is not subjected to these problems associated with Eddy currents because transmission and distribution cables are not subjected to the localized high magnetic field.

It is also necessary to employ at least one uninsulated strand in the present invention to make contact with the semiconductive layer to set up an equipotential field, thereby confining the electric field within the winding and allowing for its use as a high voltage winding. In Takaoka et al., the outer strands are insulated because that is where the skin effect current flows. Accordingly, Takaoka et al. teach away from the invention (as claimed)

because in the invention, the outer strand or strands are uninsulated for a different purpose. Therefore, in view of the foregoing, Applicants contend that one of ordinary skill in the art to which the invention pertains would not look to Takaoka et al.. Takaoka et al. do not disclose a cable as a winding, and the cable therein is not employed in high voltage applications.

Additionally, the Office relies on the fact that Jeanneret discloses certain "circuitry" but has failed to identify with specificity what "circuitry" of Jeanneret pertains to the instant invention as claimed. Jeanneret discloses only the general components of the generator (rotor, stator, and windings). Jeanneret does not disclose the use of a cable as a winding, and therefore, provides no motivation to combine this reference with the previously cited references.

Further, the conductors utilized in the Shildneck and Breitenbach et al. references are completely different than that which is provided for in the instant invention. Shildneck at most discloses the use of a hollow-center conductor as a winding. The hollow center provides for coolant to pass through the cable allowing for cooling the conductor portion. Shildneck also employs a different insulation system than the present invention.

The cable in Breitenbach et al. is likewise different in that it is not used for high voltage applications, rather it is used in linear motors. The Breitenbach et al. cable consists of four layers surrounding the conductor including a plastic layer, an insulation layer, an outer conductive layer, and a conductive sheathing. This cable would be incompatible for use in a high magnetic field environment, such as the one in the instant invention, because the outer conductive layer in conjunction with the high magnetic field would allow for Eddy currents to arise, producing increased heat and facilitating power loss.

Additionally, the application that the cable from Breitenbach et al. is employed in linear motors, which is an entirely different field of art. Linear motors do not suffer from the same stresses associated with the confined environment and high electromagnetic fields of high voltage rotating machines. Linear motors are used in intermittent service, and are not subjected to space, cooling or high magnetic field related problems as they are spread out. Whereas rotating machines are constantly running, producing considerable vibrations and mechanical stress on the winding turns which are situated closely together. Linear motors

also do not have the problems associated with Eddy currents that rotating machines have, as there is no localized high magnetic field.

No motivation can possibly exist to combine either one or both of the Shildneck or Breitenbach et al. references with Jeanneret because of the substantial differences in the conductors, as well as the differing applications and fields of art the respective cables are utilized in.

For at least the reasons stated above, Applicants respectfully request that the rejection of base claims 1, 19, 20, 29, 42 and 55 be reconsidered and withdrawn.

Additionally, Applicants submit that dependent claims 2-9, 12-18, and 38-41 include all of the limitations of base claim 1 (believed allowable), and therefore, respectfully request that these rejections likewise be reconsidered and withdrawn. Dependent claims 21-28 include all of the limitations of base claim 20 (believed allowable), and therefore, Applicants respectfully request these rejections be reconsidered and withdrawn. Applicants further assert that dependent claims 31-37 depend on base claim 29 (believed allowable), and therefore include all of the limitations thereof. Applicants respectfully request these rejections be reconsidered and withdrawn. Finally, dependent claims 43-54 depend on base claim 42 (believed allowable), therefore, for at least the same reasons set forth above, Applicants respectfully request that these rejections be reconsidered and withdrawn.

For the foregoing reasons, Applicants respectfully submit that the rejection has been traversed, and hereby respectfully request withdrawal of the rejection.

V. REJECTION OF CLAIMS 1-9, 12-29, 31-52 AND 54-55 UNDER 35 U.S.C. § 103(a)

Claims 1-9, 12-29, 31-52 and 54-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Applicant Disclosed Prior Art Figures 1 and 2 in view of Takaoka et al. (U.S. Patent No. 5,094,703) and further in view of Elton et al. (U.S. Patent No. 5,036,165; "Elton ('165)") and further in view of Jeanneret (U.S. Patent No. 5,408,169) in light of Shildneck (U.S. Patent No. 3,014,139) or Breitenbach et al. (U.S. Patent No. 4,785,138).

The Office asserts that it would have been obvious to have used the circuitry of Jeanneret and the cable assembly of Elton et al., to the device as disclosed in prior art figures 1 and 2 using round conductors in a high voltage application as shown in Shildneck or Breitenbach et al., since such a modification according to Elton ('165) would provide a conductor which prohibits the development of corona discharge.

For at least the same reasons set forth above concerning Figs. 1 and 2, and Takaoka et al., Applicants respectfully traverse this rejection. This is because the base combination of Figs. 1 and 2, and Takaoka et al. is improper, and therefore, the broader combination of the Elton et al. reference is likewise improper. However, to give the Office a full understanding of Applicants' position, the following regarding the Elton et al. reference is provided.

Applicants further submit that since the base claims 1, 19, 20, 29, 42 and 55 are believed allowable, the respective dependent claims are likewise allowable, and Applicants respectfully request the reconsideration and withdrawal of these rejections as well.

INTERPRETATION OF ELTON ET AL., U.S. PATENT 5,036,165

Important to the legal position of the Office in rejecting the present claims is its interpretation of Elton et al. (U.S. Patent No. 5,036,165; "Elton ('165)"). Applicants read the Office Action to mean that the Examiner is construing Elton ('165) as disclosing a particular type of electrical cable used as a winding in a dynamoelectric machine. For the reasons stated herein, Elton ('165) does not disclose that the electrical cable shown in Figure 1 thereof may be used for windings in a dynamoelectric machine. Rather, the conductor shown in that Figure 1 is used only for an electrical transmission and distribution cable.

Elton ('165) is a divisional of what is now issued U.S. Patent No. 4,854,565 ("Elton ('565)"). This patent is incorporated by reference, in its entirety, into Elton ('165) as is stated in column 1, lines 5-9 of Elton ('165). Therefore, Elton ('165) must be construed as if all of the text and drawings in Elton ('565) were expressly included and reproduced in Elton ('165).

Elton ('565) disclose, generally, a semi-conducting layer for insulated electrical conductors in three different embodiments. The first embodiment (Figures 1-6) deals with windings in a dynamoelectric machine. In this embodiment, the conductors are referred to

exclusively as "windings" or "bars." The second embodiment (Figure 7) relates strictly to an electrical cable used for the transmission of high voltage. Within this embodiment, the conductor is referred to as a "cable" and not as a "bar" or "winding." The third embodiment (Figure 8) relates to the use of a semiconductor layer disposed on an electrical housing surrounding digital electrical equipment. The conductor in this particular embodiment is referred to as a "housing" as opposed to a "cable", a "bar," or a "winding." In reviewing both Elton et al. references, the terms used in each reference were carefully chosen and applied uniformly throughout each reference.

The above being said, it must further be pointed out that the mention of a "dynamoelectric machine" in Elton ('165) was likely inadvertent. It appears as if that term should have been deleted when the divisional application was filed on the cable embodiment. However, whether the inclusion of "dynamoelectric machine" was inadvertent or not is immaterial since all of the Elton ('565) disclosure has been incorporated by reference, and therefore, must be considered. When the entire contents of Elton ('565) are considered, it is clear that the conductor designated 100 in Elton ('165) relates only to an electrical cable for the transmission and distribution of electrical power, and not as a winding for a dynamoelectric machine. Any other interpretation would be contrary to the plain meaning given to the words as defined in the Elton specification.

Moreover, Elton et al. do not effectively control the electric field in the end turn region. The portions of the stator "bars" in Region A (Fig. 5 of Elton '565) closest to the stator core are characterized by a different insulation system than those portions in Region B, which are outwardly of those in Region A. Region B has an increasing graded resistance (electrical stress grading region) external to the heavy insulation. This arrangement is due to the numerous turns made by the bars from one stator slot to another stator slot, each turn presenting a high stress, power limiting point. Elton et al. further teach (embodiment 70, Figure 6 of Elton '565) a grading layer internal to heavy insulation 80. Elton et al. therefore do not teach both internal and external semiconductor grading layers for a machine winding. Elton et al. therefore do not teach or suggest the present invention, as claimed.

Moreover, there is no reasonable likelihood of success for the proposed combination because the inflexibility and brittleness of the Elton ('165) cable 100, because if applied as a winding, cable 100 would impair or preclude operation of the resulting machine. Cable 100 of Elton et al. includes a pyrolyzed glass fiber layer which would crack when attempted to be wound around a core, not only negating the advantage stated by the Office of prohibiting corona discharge, but perhaps actually promoting discharge (via the cracks) or actually failing to work at all. Elton ('565) must not have expected cable 100 to be useful as a winding in an dynamoelectric machine or else Elton ('565) would have disclosed it.

Since there is no teaching, suggestion, or incentive in the art to support the modification, Applicants respectfully submit that the combination is improper. Accordingly, Applicants respectfully request that the rejection of the base claims and all dependent claims be reconsidered and withdrawn.

VI. REJECTION OF CLAIMS 1-9, 12-29, 31-52, AND 54-55 UNDER 35 U.S.C. § 102(b)

Claims 1-9, 12-29, 31-52, and 54-55 stand rejected under 35 U.S.C. § 102(b) as being fully anticipated by Elton et al. (U.S. Patent No. 5,036,165; "Elton ('165)"). For at least the reasons set forth above regarding Elton ('165), Applicants respectfully submit that this rejection has been traversed.

Although Elton ('165) discloses an electrical transmission and distribution cable comprising an internal and external layer of semi-conducting pyrolyzed glass fiber, the reference does not teach using such a cable as a winding in an electric machine. Not only does Elton ('165) fail to disclose such a use, but the cable from Elton ('165) could not be effectively used as a winding in any event, due to its inflexibility and brittleness resulting from the pyrolyzed layer as described above in Section V. Moreover, Elton ('165) does not disclose a converter.

Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn. Further, Applicants respectfully request that the dependent claims which rely on the base claims (believed allowable), also be reconsidered and withdrawn.

VII. REJECTION OF CLAIMS 1-9, 12-29, 31-52 AND 54-55 UNDER 35 U.S.C. § 103(a)

Claims 1-9, 12-29, 31-52 and 54-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Elton et al. (U.S. Patent No. 5,036,0165; Elton ('165)) in view of Takaoka et al. (U.S. Patent No. 5,094,703) in light of Shildneck (U.S. Patent 3,014,139) or Breitenbach et al. (U.S. Patent No. 4,785,138). Applicants respectfully traverse this rejection for at least the following reasons: (1) no incentive or motivation exists that would support the combination of the references, and (2) the associated dependent claims depend on base claims that are believed allowable, and therefore, include all of the limitations thereof. Accordingly, these dependent claims are likewise believed to be allowable.

The Office asserts that it would have been obvious to have provided the windings of Elton ('165) comprised of insulated and uninsulated electrical conductor strands using round conductors in high voltage applications as shown in Shildneck or Breitenbach et al. since such a modification according to Takaoka et al. would reduce the amount of insulation. First, as is set out in depth above, Applicants submit that Elton ('165) does not disclose the use of a cable as a winding. Elton ('165) simply discloses a cable for electrical transmission and distribution. Had it been obvious to use this cable as a winding, Applicants submit that Elton ('565) (incorporated by reference) would have at least disclosed this, however, this was not one of the embodiments set out in that patent. Because this cable is not disclosed as a winding, there is no motivation to combine this electrical transmission and distribution cable with the other cited references.

The Office cites that this alleged modification would reduce the amount of insulation needed, as well as the number of conductors. Applicants assert that this motivation is not persuasive as Takaoka et al. does not disclose a high voltage cable as a winding, therefore, the field of art is different, thus any related insulation system is also different. The purpose of the present invention is that the cable winding confines the electric field by the use an insulation system including semiconductor layers which allow the cable to be used as a winding in a high voltage electric machine. In high power rotating electric machines, large electrical and mechanical forces are at play. The traditional practice has been to employ high

current systems which have the drawback of producing large vibrations and stress on the end windings. When the high current interacts with the electromagnetic flux from the rotor, an alternating force is produced and applied to the winding. To account for this, the conventional approach was to use "bar windings" which were mechanically rigid to cope with the vibrations caused by the electrical forces resulting from the external electric fields. Flexible cable was thought to be ineffective in these high power machines because the vibrations and stress caused by the high current were thought to be too much for the cable.

However, it was determined that these forces could be decreased significantly if the current was decreased. Thus, the instant invention related to high voltage/low current machines. Because the current is lower, the vibrations and stress are also lower, thus the mechanical integrity of the cable winding is assured. An advantage of the cable is that it can confine the electric field within itself, and can allow for the end winding to be fully insulated, thereby reducing the forces, stress, and loss at the end winding. The field is confined by the use of two semiconductive layers. An inner semiconductive layer is in electrical contact with at least an uninsulated strand of the conductor, which allows for an equipotential surface to be created, and an outer semiconductive layer is grounded to earth potential, likewise creating an equipotential surface. The resulting equipotential surfaces minimize the risk of arcing, various losses, or partial discharge, and allow for a more efficient winding.

The motivation cited by the Office with regards to insulation is not persuasive because this system is one of high voltage and low current, whereas Takaoka et al. does not employ a high voltage cable as a winding. The system of insulation discussed in Takaoka et al. is not relevant in the instant invention because there is no longer a need to design for extreme temperatures as the current is now lower, and the cables are used in two distinct applications.

For at least the reasons above, Applicants respectfully request that this rejection be reconsidered and withdrawn. As above, it is also requested that the rejection of the respective dependent claims also be withdrawn, as it is believed that the base claims are allowable, thus the respective dependent claims are also believed to be allowable.

VIII. REJECTION OF CLAIMS 1-9, 12-29, 31-52 AND 54-55 UNDER 35 U.S.C. § 102(b)

Claims 1-9, 12-29, 31-52 and 54-55 stand rejected under 35 U.S.C. § 102(b) as being fully anticipated be Jeanneret (U.S. Patent No. 5,408,169). Applicants respectfully assert that for at least the same reasons set out above regarding this reference, this rejection is also traversed.

The Office states that Jeanneret shows "a rotating asynchronous converter employing a high voltage electric machine comprising a stator, rotor, and a winding, wherein at least one of said winding comprises a cable including at least one current carrying conductor and a magnetically permeable, electric field confining over surrounding the conductor, said cable forming at least one interrupted turn in the corresponding winding of said machine." After a careful and thorough examination of the reference, Applicants state that they are unable to find such disclosure and respectfully ask the Examiner to point out the column and line nos./Fig. Nos. where the purported disclosure can be found. Nowhere in Jeanneret does it disclose any particular type of conductor for the winding, let alone that it is specifically a cable with an electric field confining cover, situated in one uninterrupted turn. The only disclosure pertinent to the instant invention is that of the generic disclosure of the electric machines components, those being a stator, rotor and winding.

Applicants respectfully request that this rejection be reconsidered and withdrawn, as well as the rejection of the respective dependent claims which depend either directly or indirectly on the base claims.

VI. CONCLUSION

For the foregoing reasons, all presently pending claims are now believed to be in condition for allowance. Early notice of the same is hereby respectfully requested.

Respectfully submitted,

Date: March 8, 2001

By: _____

John W. Rees, Reg. No. 38,278
Dykema Gossett PLLC
39577 Woodward Ave., Suite 300
Bloomfield Hills, MI 48304-2820
(248) 203-0832
jrees@dykema.com

John P. Deluca, Reg. No. 25,505
Dykema Gossett PLLC
Franklin Square, Third Floor West
1300 I Street N.W.
Washington, DC 20005-3535
(202) 522-8626
jdeluca@dykema.com

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